

AEROLOGICAL OBSERVATIONS

By L. T. SAMUELS

Free-air temperatures for November were considerably below normal at all stations except Due West. (Table 1.) Departures decreased, in general, with altitude except at Royal Center where the means continued relatively low. The temperatures shown for the naval air stations (Table 2) are found to be in good agreement with those of the kite stations, when geographical differences are considered.

Mean free-air relative humidities were mostly above normal and those of vapor pressure below, except as, might be expected at Due West where positive temperature departures occurred. In this connection it is of interest to note that the monthly precipitation at Due West exceeded all previous records for November since the establishment of the station in 1921.

The resultant wind movement at 1,000 m. (m. s. l.) was predominantly west over the country east of the Rockies, except over Florida, where it was south over Jacksonville, and east over Key West. Resultant velocities at this level decreased generally with latitude and ranged from 9 m. p. s. over the Northern States to 1 m. p. s. over the Gulf region. At 3,000 m. a. pronounced westerly component prevailed at all stations except over the Pacific coast and Key West, where the directions were northerly and southerly, respectively. The highest resultant velocities at this level occurred over the eastern part of the country where they reached 16 m. p. s.

TABLE 1.—Free-air temperatures, relative humidities, and vapor pressures during November, 1929

Altitude (meters) m. s. l.	TEMPERATURE (° C.)									
	Broken Arrow, Okla. (233 meters)		Due West, S. C. (217 meters)		Ellendale, N. Dak. (444 meters)		Groesbeck, Tex. (141 meters)		Royal Center, Ind. (225 meters)	
	Mean	De- parture from normal	Mean	De- parture from normal	Mean	De- parture from normal	Mean	De- parture from normal	Mean	De- parture from normal
Surface.....	5.3	-4.4	11.7	+0.6	-3.1	-0.8	7.5	-5.7	0.1	-4.6
500.....	4.7	-3.9	10.2	+0.2	-3.3	-1.0	6.6	-5.8	-1.5	-4.6
1,000.....	2.8	-4.6	8.3	+0.1	-3.8	-1.9	4.8	-6.4	-3.1	-4.7
1,500.....	1.3	-5.1	6.9	+0.3	-5.1	-2.9	4.0	-5.6	-4.7	-5.0
2,000.....	-0.1	-4.8	5.5	+0.5	-7.0	-3.2	3.6	-4.1	-6.5	-5.0
2,500.....	-1.4	-3.9	3.3	+0.1	-9.0	-3.0	3.3	-2.3	-7.8	-4.4
3,000.....	-3.1	-3.2	1.4	+0.4	-11.3	-2.7	-----	-----	-10.4	-4.7
4,000.....	-7.4	-2.6	-----	-----	-15.7	-1.4	-----	-----	-16.5	-6.0
5,000.....	-12.9	-2.6	-----	-----	-21.7	-2.1	-----	-----	-----	-----

TABLE 1.—Free-air temperatures, relative humidities, and vapor pressures during November, 1929—Continued

Altitude (meters) m. s. l.	RELATIVE HUMIDITY (%)									
	Broken Arrow, Okla. (233 meters)		Due West, S. C. (217 meters)		Ellendale, N. Dak. (444 meters)		Groesbeck, Tex. (141 meters)		Royal Center, Ind. (225 meters)	
	Mean	De- parture from normal	Mean	De- parture from normal	Mean	De- parture from normal	Mean	De- parture from normal	Mean	De- parture from normal
Surface.....	73	+6	74	+4	75	-3	75	+1	82	+9
500.....	69	+5	67	+2	74	-2	66	-1	80	+8
1,000.....	64	+5	62	0	65	0	63	+4	71	+4
1,500.....	60	+8	56	-1	59	+1	61	+9	61	+2
2,000.....	60	+13	58	+6	56	+1	68	+22	55	+1
2,500.....	57	+14	50	+6	57	+3	73	+33	49	-1
3,000.....	51	+9	41	+1	56	+2	-----	-----	50	+1
4,000.....	49	+14	-----	-----	51	-5	-----	-----	55	+10
5,000.....	49	+16	-----	-----	59	+9	-----	-----	-----	-----

Altitude (meters) m. s. l.	VAPOR PRESSURE (mb.)									
	Broken Arrow, Okla. (233 meters)		Due West, S. C. (217 meters)		Ellendale, N. Dak. (444 meters)		Groesbeck, Tex. (141 meters)		Royal Center, Ind. (225 meters)	
	Mean	De- parture from normal	Mean	De- parture from normal	Mean	De- parture from normal	Mean	De- parture from normal	Mean	De- parture from normal
Surface.....	6.57	-1.65	11.47	+1.72	3.82	-0.42	7.97	-4.06	5.53	-1.07
500.....	6.02	-1.38	9.84	+1.27	3.72	-0.44	6.44	-4.09	4.83	-1.01
1,000.....	4.83	-1.40	8.17	+0.94	2.89	-0.67	5.57	-2.94	3.94	-0.88
1,500.....	4.06	-0.99	6.49	+0.75	2.44	-0.64	5.24	-2.35	3.00	-0.81
2,000.....	3.58	-0.34	5.60	+1.16	1.97	-0.64	5.95	+0.04	2.55	-0.49
2,500.....	3.05	0.00	3.65	+0.55	1.67	-0.54	6.18	+1.36	2.21	-0.26
3,000.....	2.23	-0.23	1.81	-0.45	1.34	-0.47	-----	-----	2.03	-0.13
4,000.....	1.85	+0.51	-----	-----	0.91	-0.28	-----	-----	1.58	+0.32
5,000.....	1.58	+0.76	-----	-----	0.63	-0.08	-----	-----	-----	-----

TABLE 2.—Free-air data determined at Naval Air Stations during November, 1929

Altitude (meters) m. s. l.	Temperature (° C.)			Relative humidity (%)		
	Pensa- cola, Fla.	San Diego, Calif.	Wash- ington, D. C.	Pensa- cola, Fla.	San Diego, Calif.	Wash- ington, D. C.
	Mean	De- parture from normal	De- parture from normal	Mean	De- parture from normal	De- parture from normal
Surface.....	13.6	19.8	5.5	87	44	73
500.....	13.2	17.7	4.4	73	35	67
1,000.....	12.6	16.9	2.9	70	23	62
2,000.....	11.2	12.5	-0.7	55	14	52
3,000.....	7.3	-----	-3.1	43	-----	36
4,000.....	-----	-----	-8.9	-----	-----	67

TABLE 3.—Free-air resultant winds (meters per second) based on pilot balloon observations made near 7 a. m. (E. S. T.) during November, 1929

Altitude m. s. l.	Broken Arrow, Okla. (233 meters)		Burlington, Vt. (132 meters)		Cheyenne, Wyo. (1,868 meters)		Due West, S. C. (217 meters)		Ellendale, N. Dak. (444 meters)		Groesbeck, Tex. (141 meters)		Havre, Mont. (762 meters)		Jacksonville, Fla. (65 meters)		Key West, Fla. (11 meters)		Los Angeles Calif. (40 meters)	
	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity
<i>Meters</i>	°		°		°		°		°		°		°		°		°		°	
Surface.....	N 28 W	0.7	S 20 W	2.7	N 73 W	6.8	N 13 E	0.6	N 62 W	3.2	N	2.4	S 68 W	3.1	N 15 W	0.6	N 69 E	2.6	N 53 W	2.7
500.....	N 88 W	2.2	S 40 W	6.2			S 58 W	0.7	N 65 W	4.1	N 31 E	3.4	S 28 E	1.0	N 84 E	6.6	N 77 E	0.2		
1,000.....	N 89 W	4.3	S 72 W	7.5			N 78 W	3.7	N 52 W	7.1	N 17 W	2.1	S 87 N	7.1	S 12 W	1.7	S 73 E	5.5	N 87 E	0.5
1,500.....	N 72 W	5.1	S 85 W	9.6			S 84 W	8.4	N 56 W	9.0	N 87 W	3.9	N 59 W	10.1	S 52 W	3.0	S 59 E	4.5	N 48 E	2.2
2,000.....	N 73 W	7.5	N 85 W	11.4	N 68 W	9.4	S 87 W	11.5	N 62 W	10.0	N 83 W	7.5	N 54 W	10.7	S 69 W	4.0	S 64 E	3.3	N 44 E	3.8
2,500.....	N 78 W	10.6	N 89 W	12.6	N 50 W	11.4	N 89 W	14.1	N 56 W	11.4	S 85 W	9.5	N 60 W	11.7	S 68 W	5.0	S 66 E	2.3	N 31 E	5.6
3,000.....	N 80 W	13.2	W	13.0	N 42 W	10.2	S 89 W	14.5	N 59 W	11.1	S 72 W	10.2	N 53 W	11.8	S 65 W	3.3	S	0.6	N 8 E	5.7
4,000.....	N 89 W	16.2			N 46 W	9.4	S 84 W	19.5							S 71 W	4.1	S 62 W	3.1	N 4 W	2.1
5,000.....							S 79 W	16.3							N 81 W	8.1	S 69 W	4.0		

Altitude m. s. l.	Medford, Oreg. (446 meters)		Memphis, Tenn. (145 meters)		New Orleans, La. (25 meters)		Omaha, Nebr. (313 meters)		Royal Center, Ind. (225 meters)		Salt Lake City, Utah (1,230 meters)		San Francisco, Calif. (60 meters)		Sault Ste. Marie, Mich. (198 meters)		Seattle, Wash. (67 meters)		Washington, D. C. (34 meters)	
	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity
<i>Meters</i>	°		°		°		°		°		°		°		°		°		°	
Surface.....	S 32 W	0.2	N 14 E	0.8	N 42 E	1.6	N 65 W	1.3	S 69 W	2.1	S 40 E	1.4	N 75 E	1.1	S 24 W	1.0	N 46 E	0.9	N 81 W	1.2
500.....	S 29 W	0.1	N 11 W	1.6	N 47 E	3.2	N 58 W	4.0	N 86 W	5.6			N 7 E	3.1	S 64 W	4.0	N 42 E	1.3	S 87 W	7.4
1,000.....	S 66 E	1.6	N 26 W	4.8	N 50 W	1.2	N 54 W	6.5	N 80 W	9.0			N 15 E	5.9	S 80 W	7.2	N 39 E	0.7	N 75 W	8.4
1,500.....	S 63 E	1.8	N 68 W	5.9	N 80 W	3.8	N 57 W	7.5	N 80 W	10.3	S 16 E	2.0	N 10 E	5.4	S 86 W	7.3	N 5 W	2.2	N 88 W	12.6
2,000.....	N 34 E	2.2	N 83 W	8.6	S 83 W	4.9	N 67 W	8.2	N 82 W	12.5	S 44 W	1.2	N 3 E	4.7	N 77 W	9.1	N 2 E	3.1	N 86 W	16.0
2,500.....	N 11 E	5.3	S 81 W	9.9	S 89 W	7.6	N 73 W	7.9	S 87 W	12.0	N 55 W	3.3	N 5 E	4.8	N 25 W	8.3	N 12 W	4.5	S 88 W	15.8
3,000.....	N 4 E	6.8					N 65 W	8.3	N 72 W	13.7	N 28 W	7.8	N 2 E	6.1					S 80 W	16.2
4,000.....	N 14 W	6.6					N 61 W	7.1			N 21 W	11.2	N 11 E	5.8						
5,000.....											N 23 W	15.9								

TABLE 4.—Observations by means of kites, captive and limited-height sounding balloons, during November, 1929

	Broken Arrow, Okla.	Due West, S. C.	Ellendale, N. Dak.	Groesbeck, Tex.	Royal Center, Ind.
Mean altitudes (meters) m. s. l., reached during month.....	2,836	2,264	3,389	1,940	2,539
Maximum altitude (meters) m. s. l., reached and date.....	16,131	3,616	5,188	2,749	4,024
Number of flights made.....	27	29	33	16	24
Number of days on which flights were made.....	26	27	30	16	24

1 22d.

2 14th.

3 15th.

4 6th.

5 19th.

In addition to the above there are approximately 120 pilot-balloon observations made daily at 50 Weather Bureau Stations in the United States.

551.566 (73)

WEATHER IN THE UNITED STATES

THE WEATHER ELEMENTS

By P. C. DAY

GENERAL SUMMARY

The outstanding features of the weather during November were the marked cold over the districts from the Mississippi River eastward to the Atlantic coast at the end of the month, and the continued drought over the area from the Rocky Mountains to the Pacific coast, particularly in the more westerly portions where precipitation had been deficient for many months, and the season up to the end of November had been the driest ever known. This drought continued into December, but was partly broken in the first decade of that month and rather fully relieved by the middle of the month.

PRESSURE AND WINDS

At the beginning of the month an extensive area of precipitation had overspread much of the country from the Great Plains eastward, but precipitation was generally light save in a few small areas. By the morning of the 2d precipitation had largely ceased save over a narrow area extending from southern Texas northeastward to New England, continuing over practically the same area, but moving slightly eastward during the following two

days, the falls becoming comparatively heavy locally during the 4th along or near the coast from central Georgia northeastward to the Chesapeake Bay region, the rain area practically disappearing beyond New England by the morning of the 5th.

At the morning observation of the 6th, low pressure had advanced into the central Plateau without much precipitation, and during the following 24 hours it moved to central New Mexico, attended by snows in the middle mountain region, and some rains had fallen in Texas and near-by areas. The pressure in that locality continued to fall, and, by the morning of the 8th, rain or snow had overspread a considerable portion of the southern Plains, and had extended into the west Gulf sections, continuing on the 9th over much of the same territory, the falls becoming locally heavy in portions of Texas and near-by areas. This rain area continued into the 10th, extending northward to the Great Plains and to near the western upper Lake region, with local heavy rains continuing in the coast districts of Texas. This area did not develop much strength and passed to the northward of the Great Lakes by the morning of the 11th, the precipitation extending eastward and southward into the lower Lake region, Ohio Valley, and Middle Gulf States, the area finally passing northeastward into the lower St. Lawrence Valley by the following morning.